Submitted by the expert from Poland

Informal document GRSP-67-32
(67th GRSP, 20-24 July 2020
agenda item 17(b))

Smart Kid Belt

Submitted by Poland

I. Subject

Type Approval of Smart Kid Belt under the provisions of ECE R44.04 Supplement 10.

II. Introduction

Poland issued the Type Approval for the Smart Kid Belt CRS device according to ECE R44.04 amended by supplement 10.
Approval number: E20 44R 04 4013
Issue date approval: 11 July 2017
Test report number: BLB.015.17H
Issue date test report: 27 January 2017

The Polish Type Approval Authorities approved Smart Kid Belt (SKB) based on the requirements of ECE R44.04 amended by Supplement 10. All dynamic test results have been made available and demonstrate high levels of security and safety. However, some have contested that the SKB device should have been subjected to Supplement 11, thus making the device subject to different criteria. We have clear legal opinion that demonstrates that Type Approval under Supplement 10 is the correct legal basis. The opinion was sent to the EC.

Polish type approval authority received several concerns regarding the legality of the Type Approval granted to SKB. Wording included in Supplement 11 - "This guide strap is considered as a part of a child restraint system and cannot be separately approved as a child restraint system under this Regulation" – would clearly prevent a safe, innovative and disruptive technology to be placed on the market – regardless of any concerns related to safety, dynamic test results or comparisons with other CRS devices.

SKB, despite having undergone over 100 tests worldwide, is now being tested by the Joint Research Centre in accordance with ECE 44.04. We have full confidence that these results will, once again, demonstrate the safety of the SKB device – but until such results are available for a full, open and transparent discussion, we think that this agenda item for now should be postponed until the next GRSP meeting.

During this session, following the request of the Netherlands, we can present the summary of the legal opinion regarding Supplement 10 and Supplement 11, and answer to some concerns

raised in relation to certain features of the device (not all related to safety) to ensure all parties to GRSP understand the nature and features of the device and its type-approval legal basis.

III. Summary

1. The approved Smart Kid Belt system meets the requirements of ECE Regulation No. 44 Supplement 10.
2. Legal opinion demonstrates that the Polish type-approval authority correctly interpreted the UNECE regulations and type approved Smart Kid Belt correctly based on ECE 44.04, Supplement 10.
3. Results of the SKB tests on the new Q series dummies are included; the Safety Parameters will be checked independently by the JRC under real conditions and compared to other CRS devices on the market.

IV. Summarized evaluation: Supplement 10 vs Supplement 11

[Below is a short summary of the legal opinion SKB have received. A more detailed account was sent to the European Commission. In the spirit of transparency, we would be happy to share the full legal opinion with all the Contracting Parties.

Some parties have contested that Supplement 11, rather than Supplement 10, is the correct legal basis upon which type approval can be granted. This is simply incorrect.

The type-approval granted to SKB is correct and valid. In short:

Relevant dates

- 06/2005 – entry into force of the 04 series of amendments,
- ***06/2006 – the end of the 12-month period during which the type-approvals could be granted to products compliant with the requirements of the Regulation in its version prior to the entry into force of the 04 series of amendments,***
- 08/2016 – the application for type-approval for the Product submitted to the technical service PIMOT,
- 02/2017 – entry into force of the Supplement 11 to 04 series of amendments,
- 07/2017 – decision on granting the type-approval for the Smart Kid Belt,
- ***02/2018 – the end of the 12-month period during which the type-approvals could be granted to products compliant with the requirements of the Regulation in its version prior to the entry into force of the Supplement 11.***

According to transitional provisions of the UNECE Regulation No 44 during the 12-month period following the date of entry into force of the 04 series of amendments the approval authorities can continue to grant type approvals to products which comply with the requirements of the Regulation in its previous version (paragraph 17.11). After this 12-month period the approvals can be granted only if the product meets the requirements of the Regulation as amended by the 04 series of amendments (paragraph 17.10);

The transitional provisions in paragraphs 17.11 and 17.10 shall apply uniformly to any supplement to the 04 series of amendments, including Supplement 11.

The above timeline clearly demonstrates that the decision is correct and there are no grounds for its withdrawal. The Polish type approval authority correctly identified the appropriate legal regime to grant Type Approval, taking into account **the transitional periods applicable to the Supplement 11.** If this transitional period was not valid, it would severely hamper and impede the work of all Type Approval authorities worldwide.
Consequently, the transitional provisions in paragraphs 17.11 and 17.10 of the Regulation apply not only to the 04 series of amendments, but to each supplement to this series of amendments, unless provided otherwise. Therefore, paragraphs 17.11 and 17.10 of the Regulation should apply to the Supplement 11.

As Supplement 11 entered into force, 9 February 2017, the 12-month period ends on 9 February 2018. In the procedures of granting type-approvals initiated after this date the approval authorities must take into account the requirements of the Regulation as amended by the Supplement 11. Consequently, approvals granted in procedures initiated between 9 February 2017 and 9 February 2018 may be based on the previous version of the Regulation. The decision on this matter belongs to the approval authority, in this case in Poland.

Finally, and as outlined in our legal opinion, we abide by the *tempus regit actum* ("time rules the act") principle, which requires that a rule of law must be non-retroactive and that legitimate expectations of the applicant must be protected.

For these above reasons, any additional provisions included in Supplement 11 (including 2.8.8) do not apply to the Smart Kid Belt, so long as all provisions of Supplement 10 are met – which the SKB device clearly does. In addition, the requirements in Supplement 11 do not directly relate to the safety of the device, and so based on the above, we again strongly hold the view that there are no grounds for the withdrawal of the Type Approval for SKB.

Respective legal advice has been sent to European Commission. As for now
none of the GRSP member nor EC has presented contrary legal argumentation.

V. Supplement 11 and Guide Strap Belts

As set out above, Smart Kid Belt did not need to receive Type Approval under Supplement 11, which includes the point that a guide strap cannot be approved as a Child Restraint System.

As Smart Kid Belt was approved as a forward-facing CRS and the tests were performed when Supplement 10 was in force, this provision does not apply to the Smart Kid Belt system.

VI. Influence of the car design

Some parties have concerns about the safety of SKB being influenced by the car design (location of seat belt anchorage points, the seat shape, structure, and material).

The method of fastening the SKB device is however precisely defined in the instructions. The installation method described clearly defines the fastening of the system and the positioning

of the vehicle seat belt. According to the presentation presented at the fifth meeting of the information exchange forum the Smart Kid Belt device will be checked against UN Regulation No 44 independently by the JRC, and again, it is on this basis that we recommend a full, open and transparent discussion – comparing all CRS devices testing results in different vehicles – when these results have been published and assessed.

Number of Runs	2	1	2	1
Device Under Test	SmartKidBelt	SmartKidBelt	Standard Booster Seat	No Child Restraint System
Type	Test on Trolley and Real Car Seat - Forward Facing	Test on Trolley and Real Car Seat - Forward Facing	Test on Trolley and Real Car Seat - Forward Facing	Test on Trolley and Real Car Seat - Forward Facing
Manikin	Group II - Heaviest 22 kg	Group II - Heaviest 22 kg	Group II - Heaviest 22 kg	Group II - Heaviest 22 kg
Fixing point	R44 (150 mm from lower part of seat belt)	SKB (Closest to buckle)		
Test	As prescribed in UNECE 44			
Mesurements	As prescribed in UNECE 44			

Table 1 *Test with real car seat for safety assessment*

VII. Production year v's LOT numbers

Certain parties have concerns that the SKB does not contain the year of production printed on the device. This matter concerns safety in so far as certain devices should not be used beyond their intended lifespan, hence why SKB uses clear LOT numbers which are identification on the devices.

A LOT number is an identification number assigned to a particular quantity or LOT of material from a single manufacturer. LOT numbers can typically be found on the outside of the packaging. For cars, a lot number is combined with a serial number to form the Vehicle Identification Number. The LOT number precisely and sufficiently defines the date of manufacture of the Smart Kid Belt system.

VIII. "Universal" categorization

The Netherlands, in their submission, have pointed out that 6.1.8 states:

'Child restraint systems of the "universal" category […] shall have a main load-bearing contact point, between the child restraint and the adult safety belt. This point shall not be less than 150 mm from the Cr axis when measured with the child restraint on the dynamic test bench installed under Annex 21 to this Regulation, without a dummy. This shall apply to all adjustment configurations.'

The Netherlands have not, however, included the second part of the regulation item 6.1.8:

'Additional alternative belt routes are allowed. Where an alternative belt route exists, the manufacturer shall make specific reference to the alternative route in the user instructions, as required in paragraph 15. When tested, using such an alternative belt route(s), **the restraint shall comply with all the requirements of the Regulation except for this paragraph**.'

The Netherlands have concerns that SKB does not meet the requirements in relation to the main load-bearing contact point which 'shall not be less than 150mm from Cr axis when measured with the child restraint on the dynamic test bench installed under Annex 21 to this Regulation, without a dummy. This shall apply to all adjustment configurations.

Below is an example of a Child Safety Seat and a Booster Seat. Dimensions of the seat and the seat cushions shown in Figure 1 and Figure 2 are under the requirements of ECE R44.

Figure 1 Main load-bearing contact point measurement

Figure 2 Main load-bearing contact point measurement

As we can see there are CRSs available on the market which, despite the ECE R44 approval, do not meet the requirements of point 6.1.8.

6.2.2. […] all restraint devices utilizing a "lap strap" shall positively guide the "lap strap" to ensure that the loads transmitted by the "lap strap" are transmitted through the pelvis. The assembly shall not subject weak parts of the child's body (abdomen, crotch, etc.) to excessive stresses.

Testing (see test report BLB.015.17H) Dynamic testing of the 22 kg P6 dummy

The manufacturer of the SKB device has undergone over one hundred tests to assess and ensure all safety parameters are met. Expert detailed analysis of those tests results have not demonstrated any risks as indicated by some of the GRSP participants.

Best evidences for positive guide of the "lap strap" are photos from real life example as well as from testing benches.

SMART KID BELT

CRS 1

SMART KID BELT

CRS 2

SMART KID BELT

CRS 3

SMART KID BELT

CRS 4

IX. Dynamic testing

Dynamic testing of the 22 kg P6 dummy

In accordance with paragraph 1.2 of Annex 8 to UN Regulation 44, the use of equivalent dummy is permitted. Measurement capabilities, dimensions and mass of the Hybrid II dummy are comparable to the technical data of the P6 dummy. Moreover, the Hybrid II

dummy is an internationally recognized testing device included, inter alias in the normative documents: FMVSS 208 and FMVSS 213.

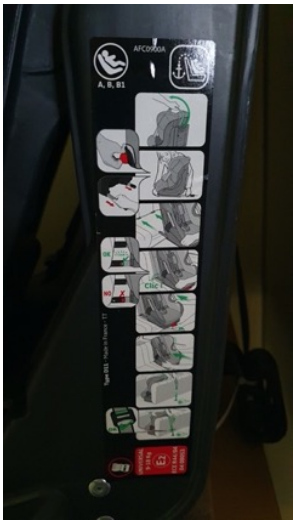
Dynamic testing of the 32 kg P10 dummy
During the tests, the vertical distance between the floor and the Cr point was 210 mm in accordance with point 3.3.1.1. of annex 6. The height of the floor should be adjusted only for the test of restraint with support.

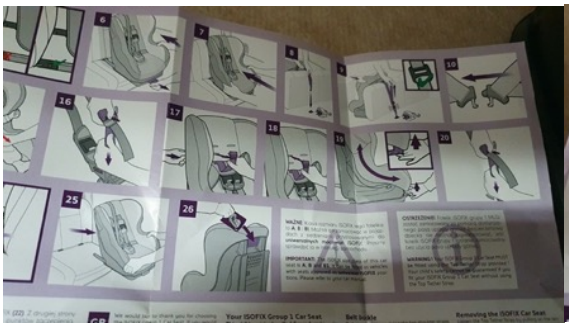
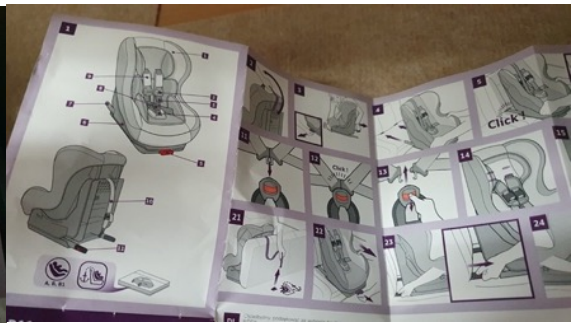
Reporting (see test report BLB.015.17H). Test report of type approval and production qualification.
The test report contains all the data necessary for a correct assessment of the device. The annex to the report does not include information on the measurement of time at the time of maximum head displacement. However, this parameter was included in the research process. During production qualification tests, for the thorax, only the value of its resulting acceleration is assessed in accordance with paragraph 7.1.4.2.1 of the regulations.

X. Instruction & Markings

Manufacturer has already taken respective remedial measures. However, the issue has not substantial impact on safety.

We can also see that SKB is not sole CRS on the market with same issue. We can easily find similar examples of different CRS' in current distribution with incorrect markings and instruction. The examples are shown below.

XI. Comparative Analysis of Child Restraint Systems Safety Parameters in Relation to the Regulation No. 129 of the Economic Commission for Europe of the United Nations (UN/ECE)

Old type of "P" dummies has certain limitation when it comes to number of safety parameters we can read; therefore, it was decided to conduct comparative evaluation of SKB system vs other 4 different CRS' according to ECE Regulation No. 129. The frontal collision simulation tests for Child Restraint Systems were carried out in an accredited test unit authorized to carry out tests according to the guidelines of ECE Regulation No. 129. The tests were focused on determining the impact of the dynamic loads acting on the child's body transported in five child restraint systems. It was also determined how measured parameters meet the new guidelines of the No. 129 Regulation.

The tested devices were mounted on the specially prepared test seat for the approval process prepared according to Annex 6 ECE 129. The requirement for a seat cushion and supporting the test bench from a square foam block was subjected. For frontal impact, the trolley shall be so propelled that, during the test, its total velocity change ΔV is 52 + 0 – 2 km/h and its acceleration curve is within the hatched area of the graph in Annex 7, Appendix 1 and stay above the segment defined by the coordinates (5 g, 10 ms) and (9 g, 20 ms). The start of the impact (T0) is defined, according to ISO 17 373 for a level of acceleration of 0,5 g. For the most research credibility, the tests were carried out on the same day under the same temperature conditions. All five devices for tests were delivered 48 hours before the planned tests and were stored at the Institute in a specially prepared air-conditioned room. During the tests, the image from the collision was recorded using two high-speed cameras, and the acceleration and forces measured on the dummy in selected parts of its body. For the tests, the anthropomorphic dummy Q6 series was used (corresponding to children under the age of six).

The sensors were registered by the following parameters:

- the test trolley acceleration,
- dummy's head acceleration, where the maximum value may not exceed 80g for the Q6 head cumulative 3 ms value,
- dummy's chest acceleration, where the maximum value may not exceed 55g for the Q6 chest cumulative 3 ms value,
- the forces and bending moment in the upper part of the cervical spine,
- deflection of the dummy torso,
- pressure in the left and right abdominal sections of the dummy.

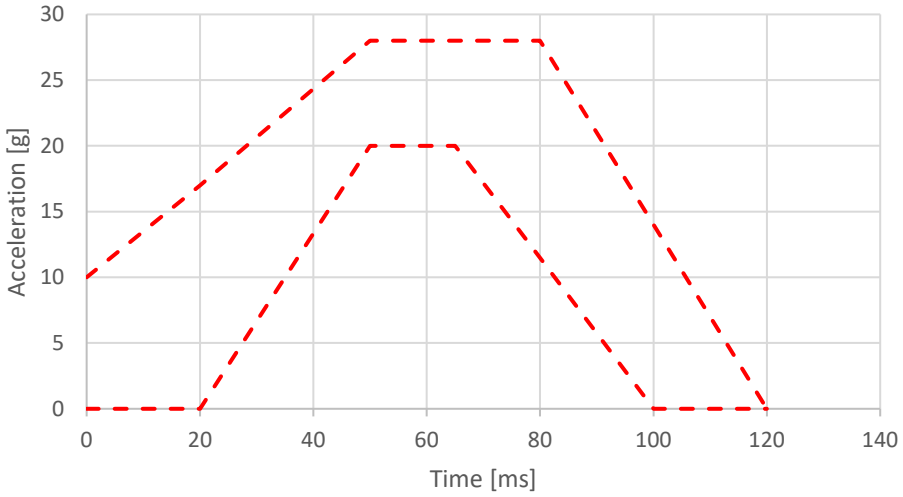


Figure 3 Description of the acceleration curve of the test trolley

For all tested devices the data was shown inline charts. For additional visualization, all characteristic values had been compared into bar charts.

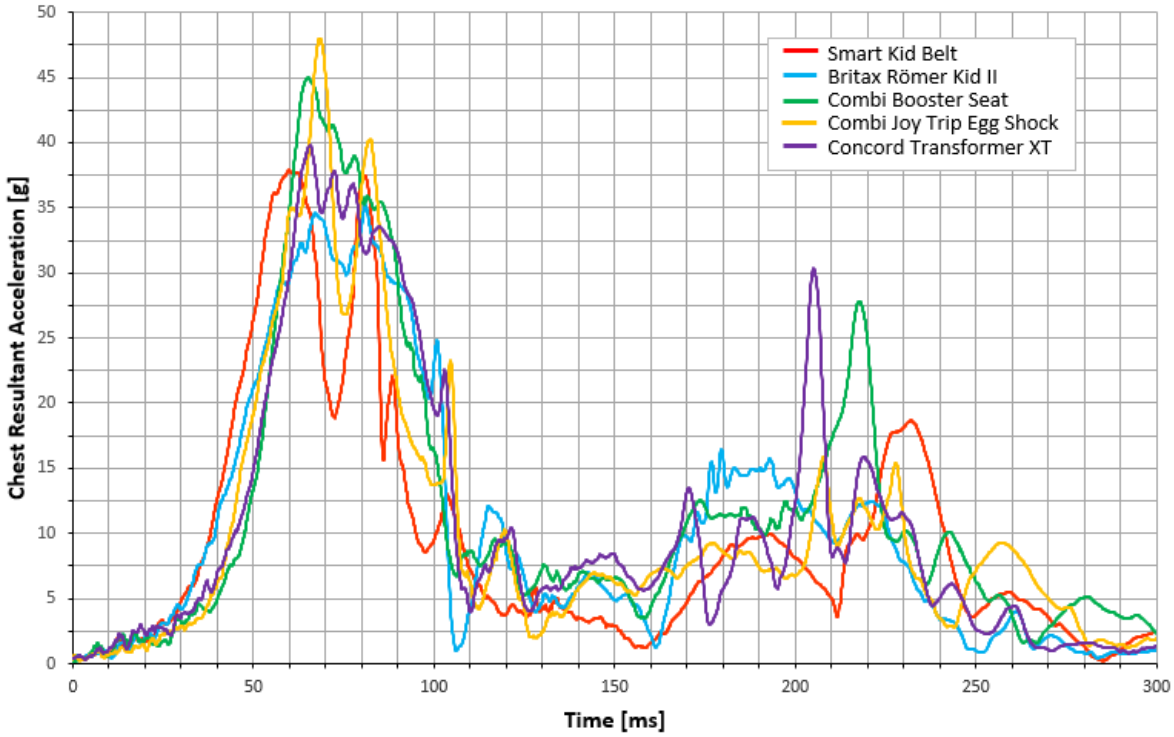


Figure 4 Chest Resultant Acceleration for all CRS tested

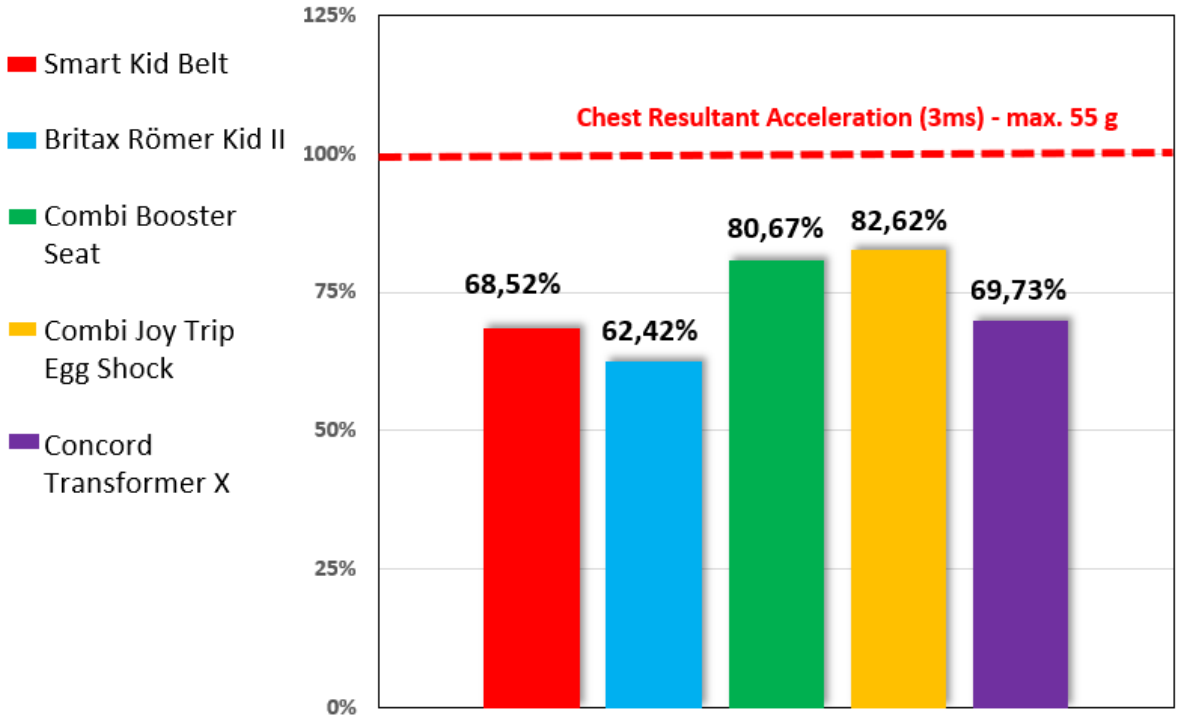


Figure 5 Chest Resultant Acceleration for all CRS tested regarding the maximum limit

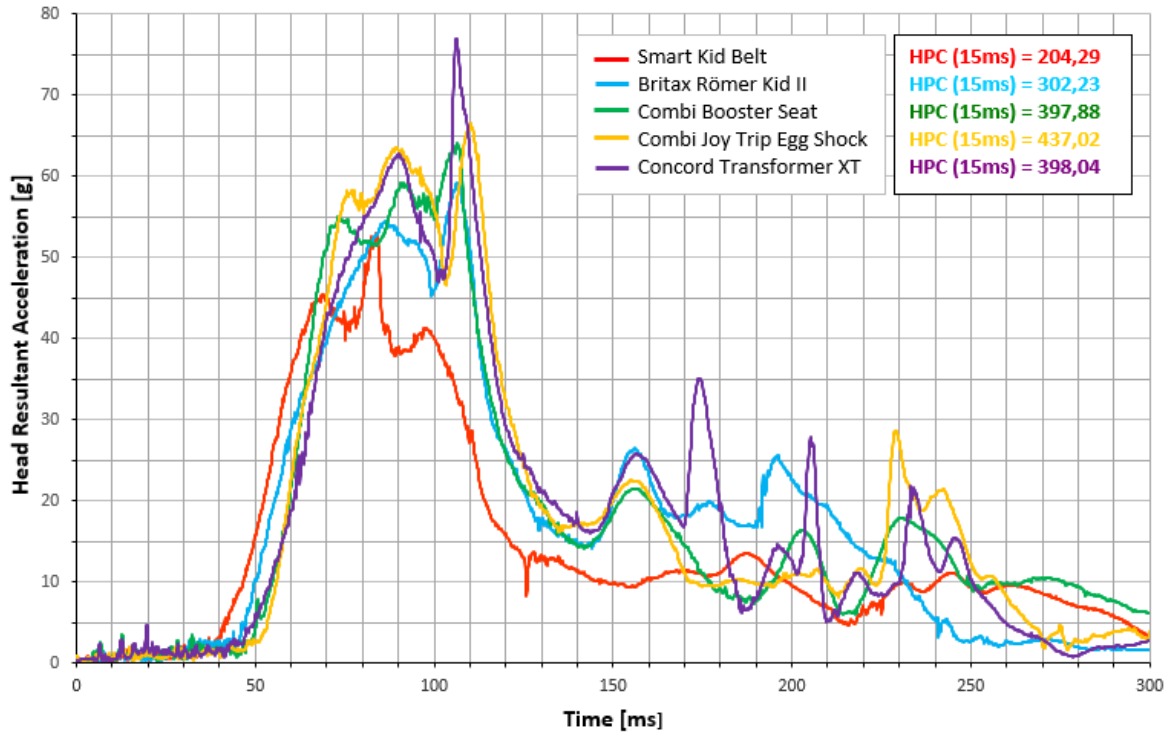


Figure 6 Head Resultant Acceleration for all tested devices

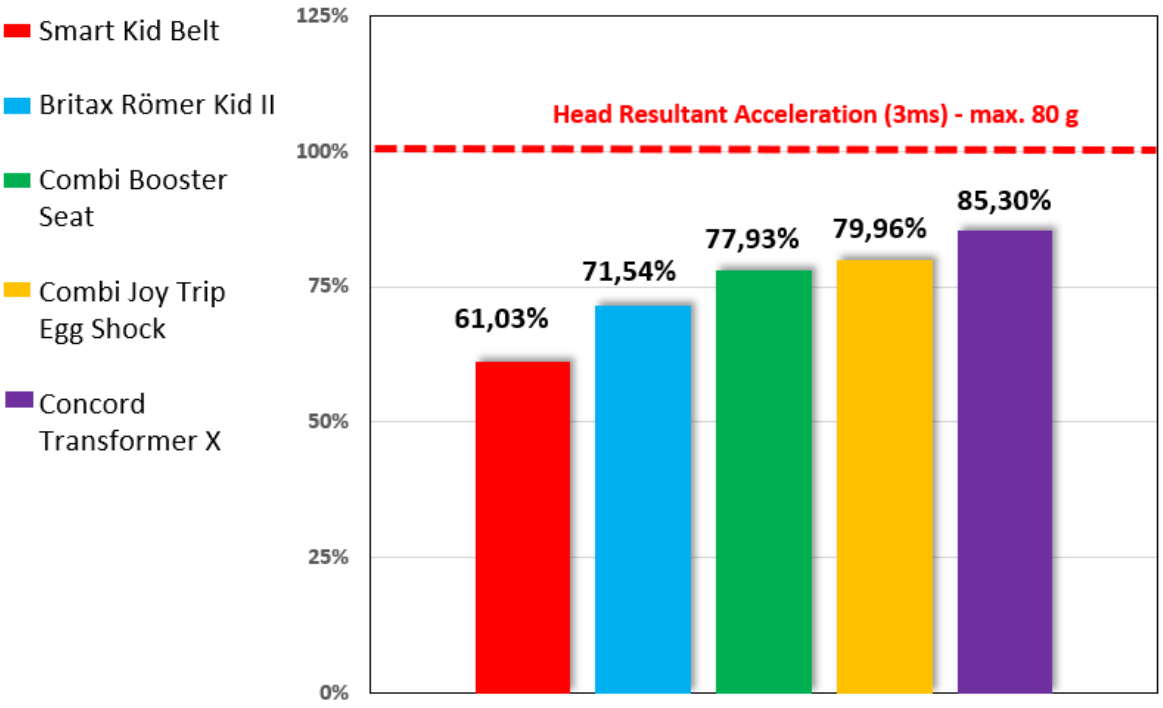


Figure 7 Head Resultant Acceleration for all tested devices regarding the maximum limit

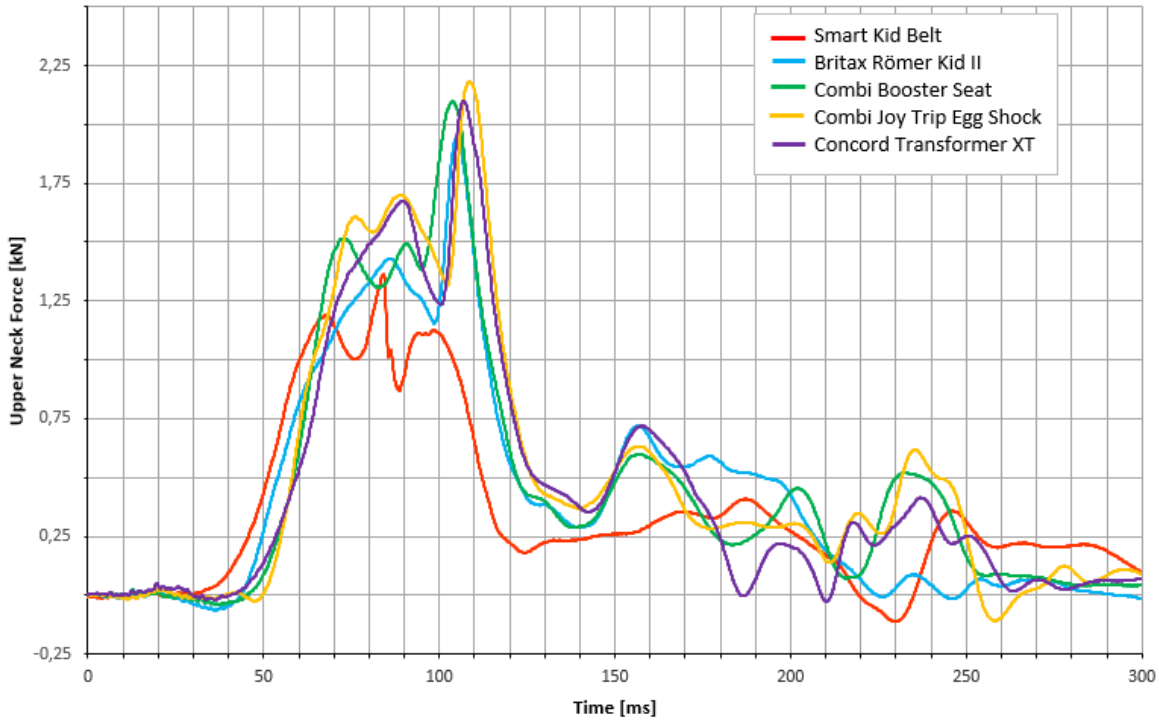


Figure 8 Upper neck force for all tested devices

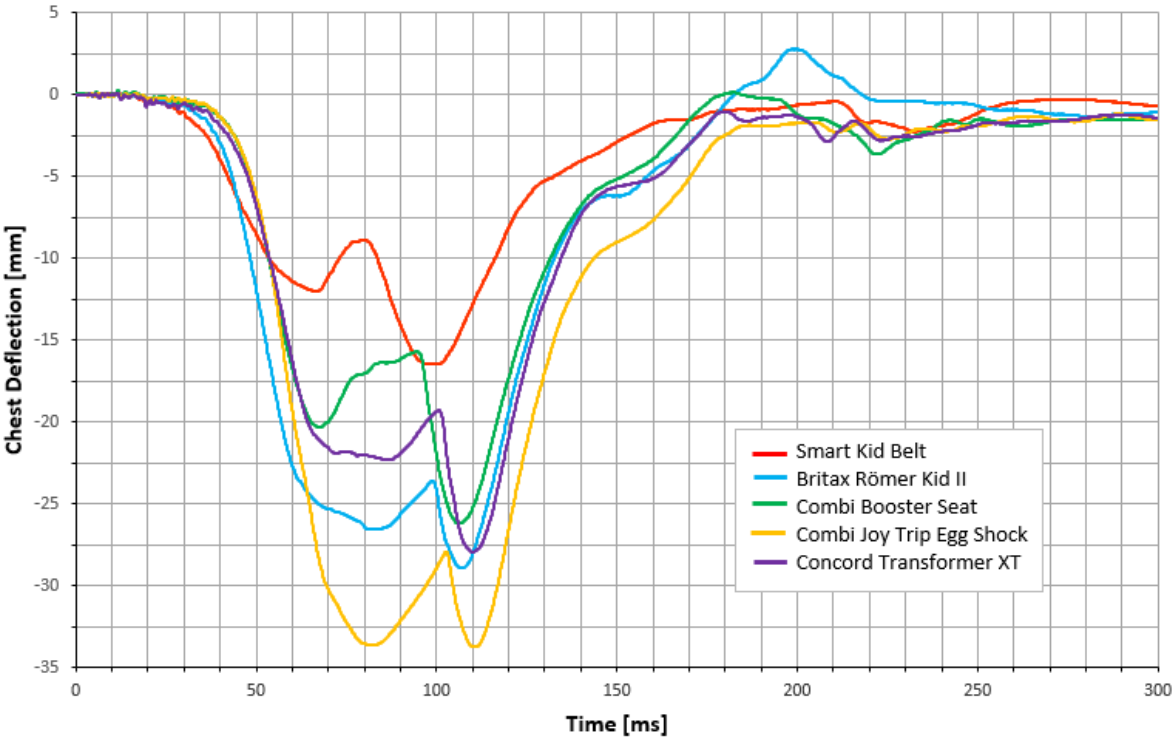


Figure 9 Chest deflection for all tested devices

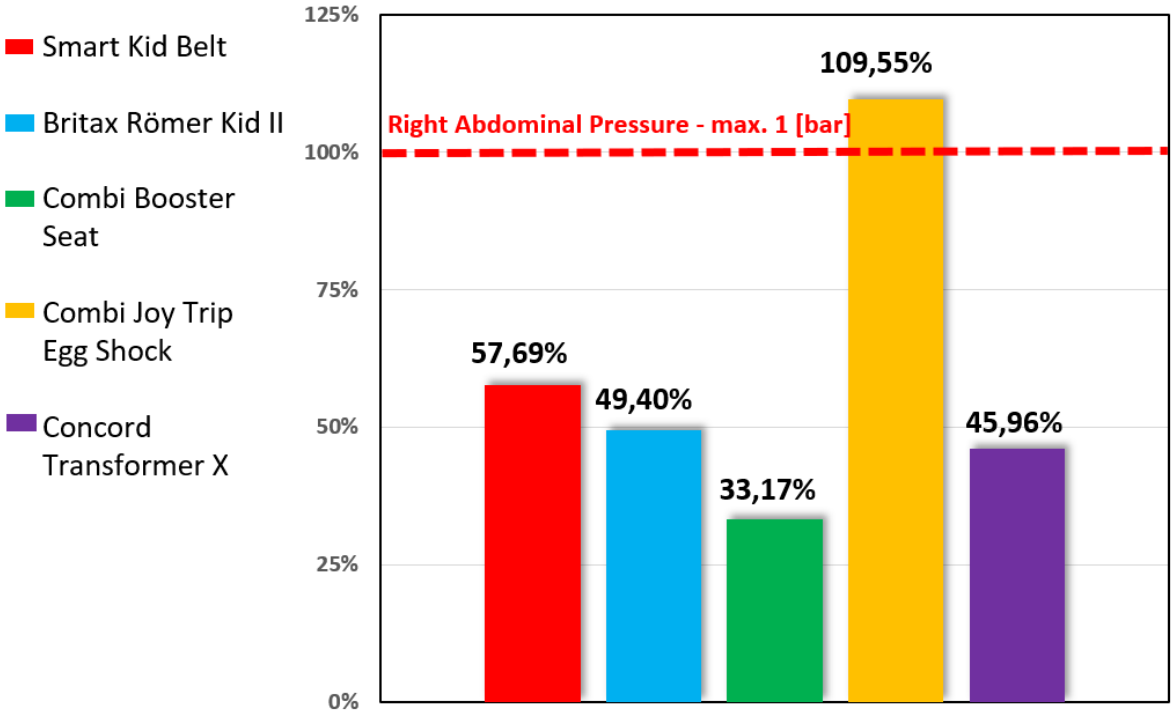


Figure 10 Right abdominal pressure for all tested devices regarding the maximum limit

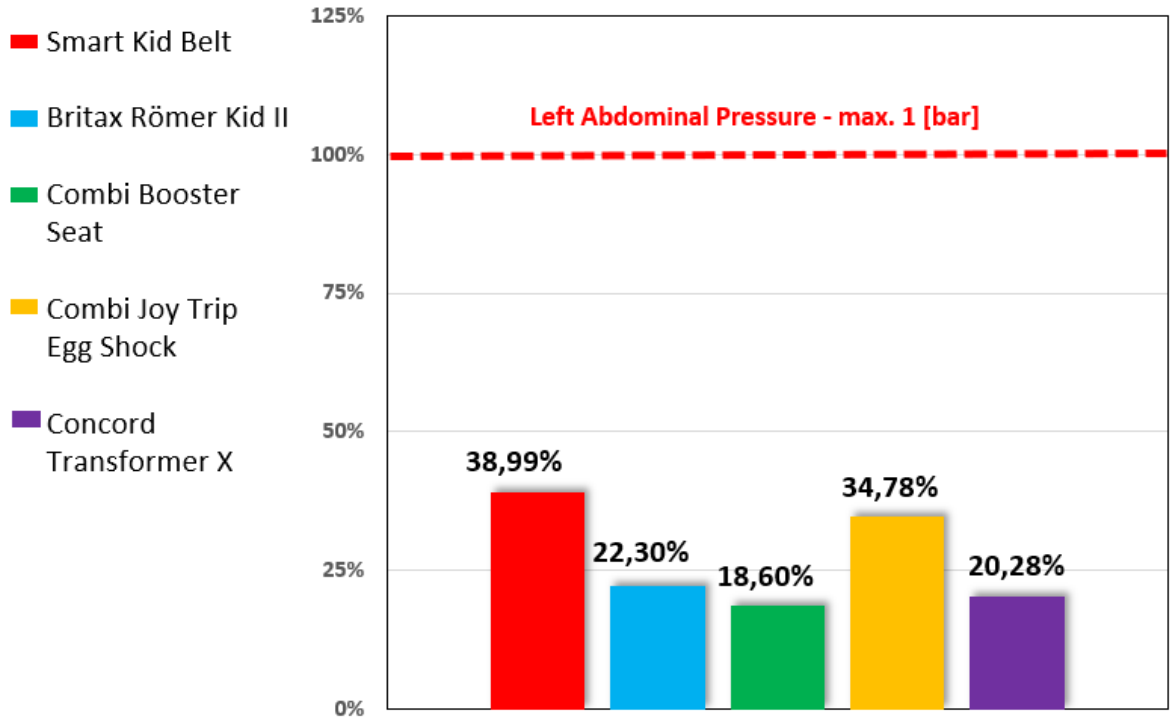


Figure 11 Left abdominal pressure for all tested devices regarding the maximum limit

According to the No. 129 UN / ECE regulation the highest recorded value of abdominal pressure is applicable for injury assessment. For the proper measurement selection, higher pressure value from both sides are taken into account. Analyzing the test results, it can be stated that the maximum recorded values of pressure in the left abdominal segment are:

- for the Smart Kid Belt: 0,39 bar after 81,7 ms which is 38,99 % of the limit,
- for the Britax Römer Kid II: 0,22 bar after 84,3 ms, which is 22,3 % of the limit,
- for the Combi Booster Seat: 0,19 bar after 85 ms, which is 18,6 % of the limit,
- for the Combi Joy Trip Egg Shock: 0,35 bar after 85,5 ms, which is 34,78 % of the limit,
- for the Concord Transformer X: 0,2 bar after 99 ms, which is 20,28 % of the limit.

The recorded values of right abdominal pressure for individual restraint systems are:

- for the Smart Kid Belt: 0,58 bar after 79,7 ms which is 57,69 % of the limit.
- for the Britax Römer Kid II: 0,49 bar after 89,6 ms, which is 49,4 % of the limit,
- for the Combi Booster Seat: 0,33 bar after 102,6 ms, which is 33,17 % of the limit,
- for the Combi Joy Trip Egg Shock: 1,1 bar after 85,2 ms, which is 109,55 % of the limit,
- for the Concord Transformer X: 0,46 bar after 88,1 ms, which is 45,96 % of the limit.

Based on my evaluation of the test results, it can be seen that the safety criteria pointed in Regulation No. 129 have been met for almost all tested restraint devices (except for abdominal pressure in one of the tested solutions). However, the analysis of recorded data and individual values of physical quantities perfectly show significant differences between each solution. Based on the results from IDIADA, it can be concluded that the Smart Kid Belt can be considered as safe forward-facing CRS. System performed very well when tested in terms of all safety parameters and we could not observe any risk factor indicated by some GRSP participants.